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Most Measles Cases in 25 Years: Is This the End of Measles Elimination in the United States?

Clinician Outreach and Communication Activity (COCA) Webinar

emergency.cdc.gov/coca

May 21, 2019



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- ❑ **If you are a patient, please refer your questions to your healthcare provider.**

At the conclusion of the session,
participants will be able to accomplish the
following:

- Identify the clinical presentation of measles.
- Discuss current measles epidemiology in the United States.
- List measles vaccine recommendations.
- Describe measles guidance in health care settings.

Today's First Presenter



Manisha Patel, MD, MS

Measles Surveillance Team Lead
Division of Viral Diseases
National Center for Immunization and Respiratory
Diseases
Centers for Disease Control and Prevention



Today's Second Presenter



Adria Lee, MSPH

Measles Epidemiology Team
Division of Viral Diseases
National Center for Immunization and Respiratory
Diseases
Centers for Disease Control and Prevention



Today's Third Presenter



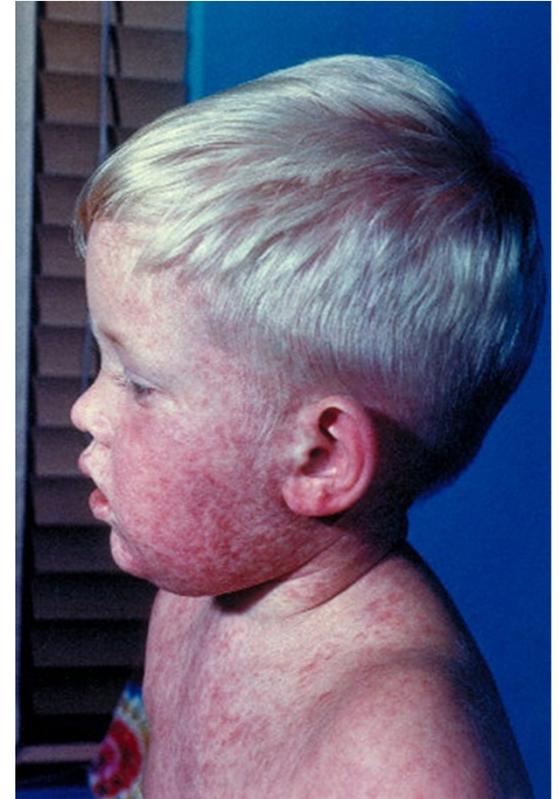
Ryan Fagan, MD, MPH&TM

Consultation and Training Team Lead
Division of Healthcare Quality Promotion
National Center for Emerging and Zoonotic Infectious
Diseases
Centers for Disease Control and Prevention



Measles

- Acute, febrile rash viral illness
- Transmitted by direct contact with infectious droplets or airborne spread
- Most contagious of the vaccine preventable diseases
 - $R_0 = 12-16$
 - Secondary attack rate in susceptible household contacts ~90%



Clinical presentation

- **Incubation period** 10-14 days (range 7-21 days)
- 2-4 day prodrome
 - “The 3 C’s”: cough, coryza, and conjunctivitis
 - Koplick spots (white lesions on inner cheek), 2 days before rash onset
 - Fever up to 40.6°C (105°F)
- Rash begins approximately 14 days after exposure
 - Rash onset date is “day 0”
- **Infectious period** 4 days prior through 4 days after rash onset



Measles Complications

Diarrhea	8%
Otitis media	7 – 9%
Pneumonia	1 – 6%
Hospitalized	1 in 4 cases
Encephalitis	1 per 1,000 cases
Death	1 – 3 per 1,000 cases
Subacute Sclerosing Panencephalitis (SSPE)	1 per 100,000 cases

Complications are more common in children <5 years and adults.

A few words on SSPE...

- Rare, but fatal progressive neurologic disease
 - Higher incidence in children aged <2 years
- Onset 7 years after infection, but could present decades after
- Clinical symptoms
 - Initially mild, mental deterioration (memory loss, behavioral changes)
 - Progression to myoclonic seizures, motor disability, and eventually to a persistent vegetative state
 - Death typically occurs within 1-3 years of diagnosis

Prioritize measles on your differential diagnosis of a febrile rash illness if your patient:

- Has not been vaccinated against measles
- Has traveled internationally, or has been exposed to someone who traveled internationally, within 21 days prior to the onset of their rash
- Is living in or visiting a community where there is a measles outbreak



If you suspect a case of measles you should:

- Mask and promptly isolate the patient in a room with the door closed
- Collect a throat or nasopharyngeal swab for molecular testing using real-time polymerase chain reaction (RT-PCR) and blood for serology (IgM)
- Call your local health department or infection control team
 - Provide instructions on where to send specimens
 - Identify who was exposed and who might need post-exposure prophylaxis with either MMR vaccine or immunoglobulin
 - Prioritize exposed persons who are at high risk for serious disease including:
 - Infants aged <1 year
 - Pregnant women
 - Persons with immunocompromising conditions

Measles Vaccine Recommendations and Coverage, United States

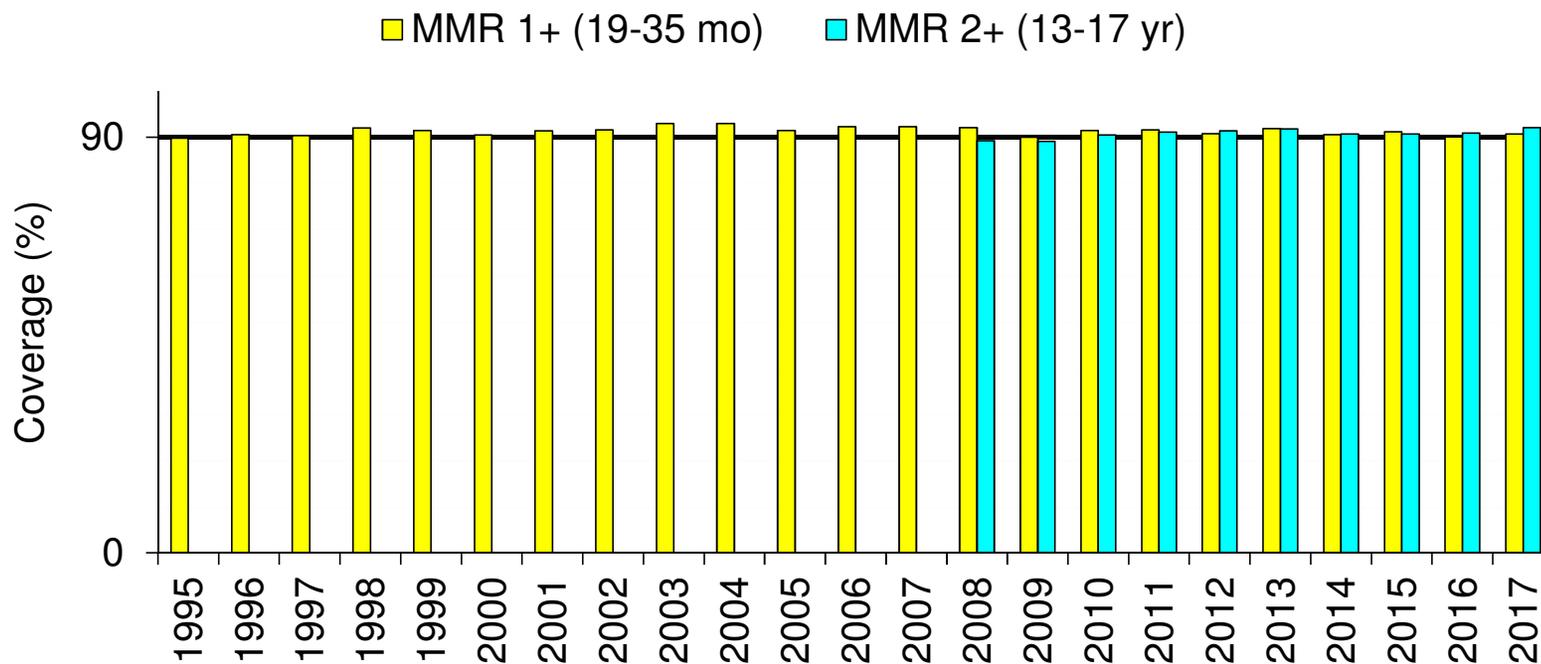


Measles Vaccine

- Licensed in 1963 in the U.S.
- Combination measles-mumps-rubella (MMR) vaccine licensed in 1971
- Vaccine effectiveness:
 - 1-dose: ~93%
 - 2-doses: ~97%
- Excellent safety profile over last 50 years
 - Low risk of febrile seizures in children aged 12 – 23 months (1 in 3,000 doses)
 - Temporary pain/stiffness in joints (teenage or adult women)
 - Temporary low platelet count (1 in 30,000 doses)



MMR Vaccine Coverage, National Immunization Survey, U.S., 1995 – 2017



NIS data available at <https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/mmr/trend/index.html> <https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/mmr/trend/index.html>

MMR Vaccine Routine Recommendations

- Children and Adolescents
 - One dose at 12 – 15 months of age and a second dose at 4 – 6 years of age
- Adults without evidence of measles immunity*
 - Most adults need one dose
 - Two doses for high risk adults, at least 28 days apart
 - healthcare personnel
 - post-high school students
 - international travelers

*Presumptive Evidence of Immunity

- Birth before 1957
- Laboratory evidence of immunity
- Laboratory confirmation of disease

2013 ACIP recommendations: <http://www.cdc.gov/mmwr/pdf/rr/rr6204.pdf>

2019 Adult Immunization schedule: <http://www.cdc.gov/vaccines/schedules/hcp/adult.html>

MMR Vaccine Travel Recommendations

- Persons aged ≥ 12 months without other evidence of immunity should receive 2 doses*
 - Includes providing a 2nd dose to children aged 1 – 4 years before they reach age 4 – 6 years
 - Includes adults** who have only received one routine dose in the past
- Children aged 6 – 11 months should receive 1 dose
 - If vaccinated at age 6-11 months, still need 2 subsequent doses at age ≥ 12 months

2013 ACIP recommendations.

*2nd dose of MMR vaccine should be administered at least 28 days after the 1st dose

**Born in 1957 or later

What adult providers need to know for their patients

- Providers do not need to actively screen adult patients for measles immunity
 - high population immunity and low risk of disease among adults in non-outbreak areas in the U.S.
 - Providers should make sure patients have measles protection before international travel
 - U.S. residents traveling internationally are at high risk for acquiring measles abroad
 - Importations into the U.S. can lead to transmission to susceptible persons, such as infants, and outbreaks
 - Providers should vaccinate if the patient's measles immunity status is unknown - serologic testing is not recommended.
 - There is no adult catch-up program for adults born before 1989, or otherwise
- 

What providers need to know about vaccination during outbreaks

- Providers should consult with local health departments for the most up-to-date recommendations
 - This may include additional doses of MMR for your patients (similar to travel recommendations)
- In limited circumstances, health departments may recommend vaccination of infants 6 through 11 months of age with one dose of MMR vaccine
 - Outbreak is affecting infants aged <12 months
 - Outbreak demonstrates sustained, community-wide transmission
 - Benefit of early protection against measles during a period of increased transmission and exposure should be weighed against risk of decreased immune response following subsequent MMR doses in infants vaccinated at <12 months of age compared with infants vaccinated at ≥12 months of age
 - MMR dose given prior to 12 months of age does not count towards routine schedule

Summary

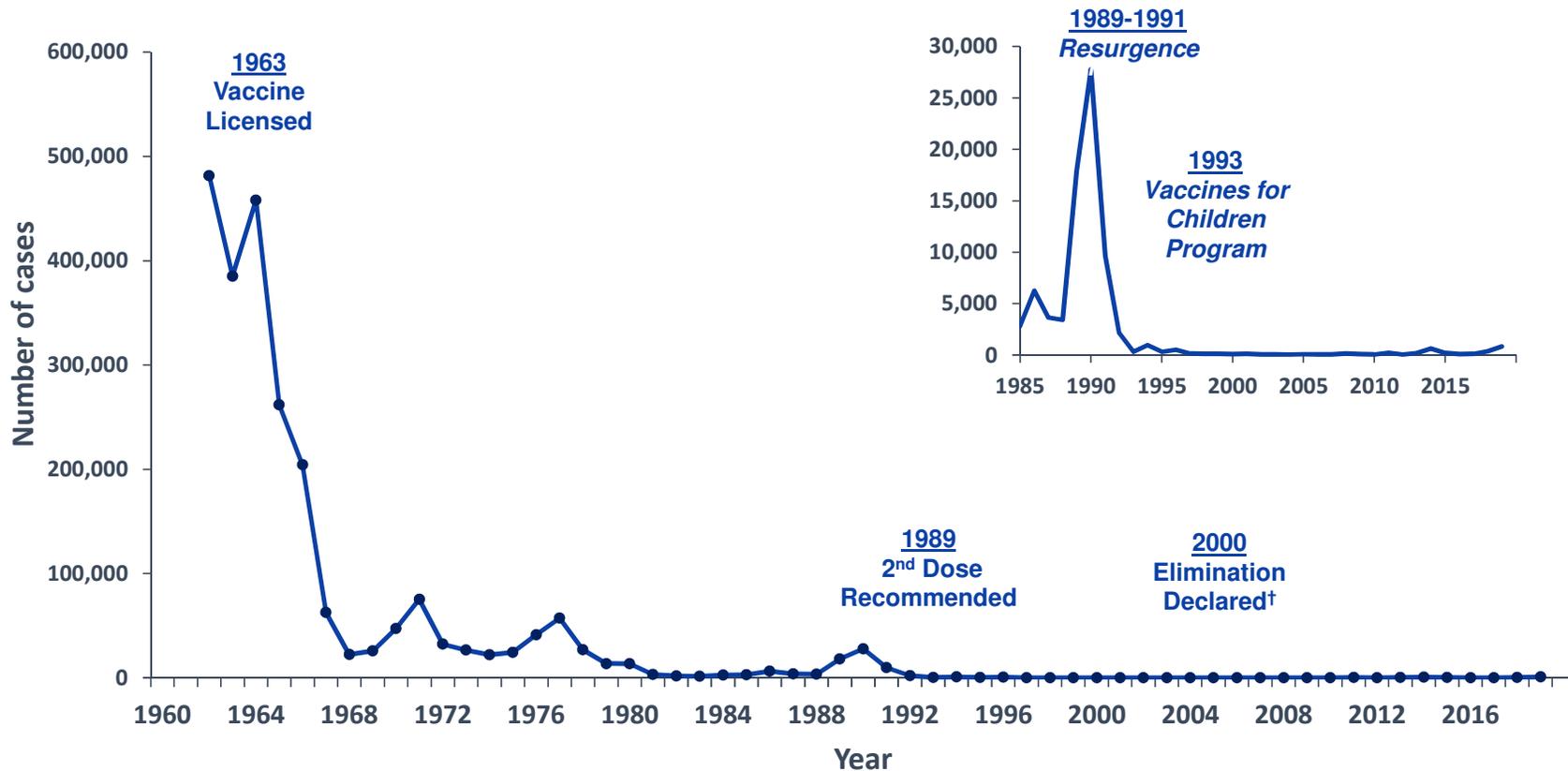
- Providers should prioritize measles on the differential diagnosis for any patient presenting with a febrile rash who is unvaccinated, recently traveled internationally, or may have been exposed to a measles case or outbreak
 - Providers do not need to actively screen their adult patients for measles immunity
 - Most adults in the United States are at low risk for measles b/c of high population immunity
 - Providers should ensure patients traveling internationally be vaccinated against measles, or have other evidence of immunity
 - This may mean additional doses of MMR for some patients
 - Providers should consult with their local health departments during measles outbreaks to see if additional steps are needed to protect their community
- 

Epidemiology of Measles in the Post-Elimination Era, 2001—2019

Adria Lee, MSPH - Measles Epidemiology Team, Division of Viral Diseases, CDC



Reported Measles Cases, United States, 1962–2019*



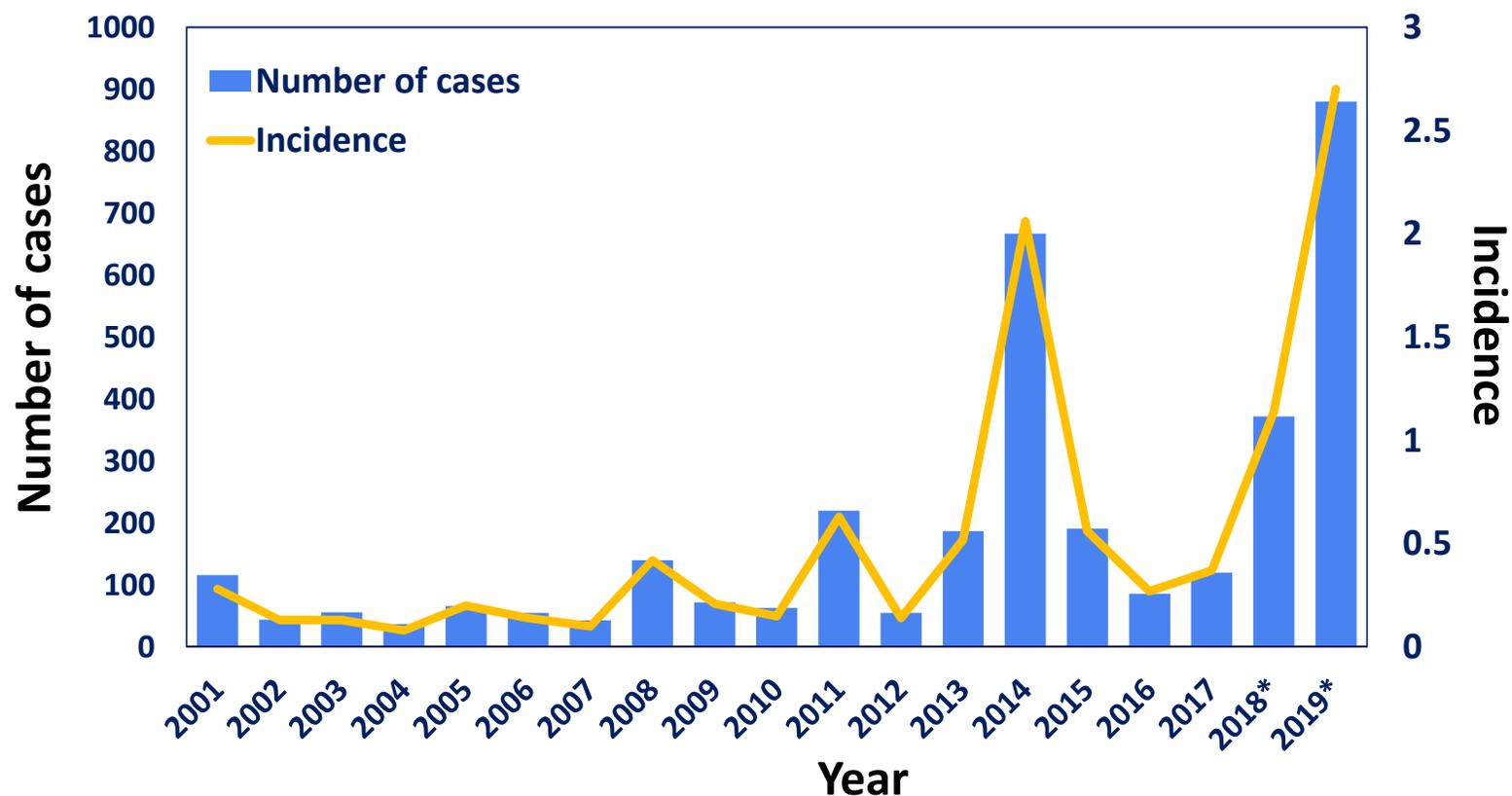
*2018 and 2019 data are preliminary and subject to change

†Elimination is defined as the absence of endemic measles transmission in a region for ≥ 12 months in the presence of a well-performing surveillance system

Measles Elimination in the U.S.

- **Elimination: Interruption of year-round transmission**
 - Does not imply zero incidence
 - **Vaccine coverage >90% for 2 doses of MMR**
 - **Strong public health response to each case**
 - Resource-intensive
 - **Epidemiology of measles during elimination characterized by**
 - Importations from endemic areas
 - Limited spread among non-immune persons
- 

Number and Incidence of Reported Measles Cases – U.S., 2001 –2019* (N=3470)



*Source: National Notifiable Diseases Surveillance System (passive surveillance); 2018 and 2019 data as of May 17, 2019

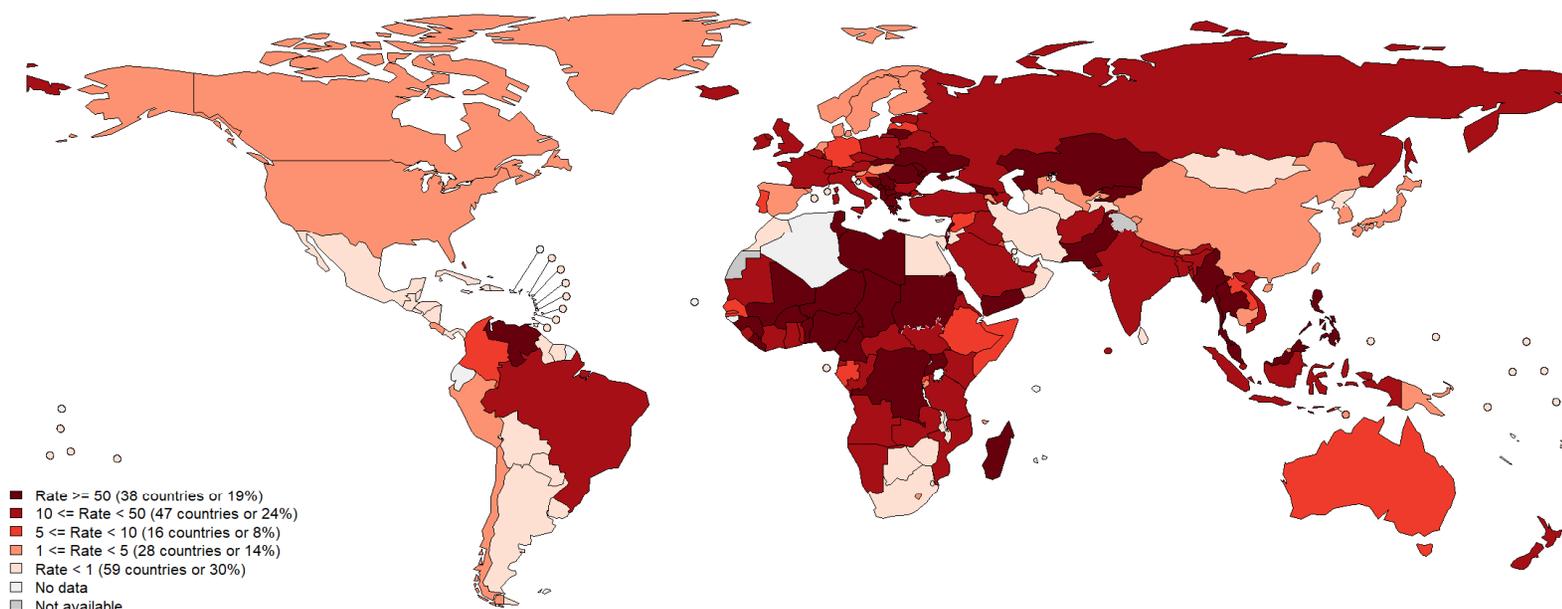
Measles Incidence Rate per Million (12M period)

Top 10**

Country	Cases	Rate
Madagascar	84804	3406.53
Ukraine	78659	1770.06
India	53170	40.15
Pakistan	22693	117.46
Philippines	16898	163.55
Yemen	13639	494.45
Nigeria	12745	68.53
Brazil	10316	49.68
Thailand	6914	100.4
Kazakhstan	5908	328.45

Other countries with high incidence rates***

Country	Cases	Rate
Georgia	4678	1191.72
Liberia	2367	513.02
Israel	3755	458.38
Kyrgyzstan	2534	425.47
The Republic of North Macedonia	885	425.23
Albania	1169	399.47



Map production: World Health Organization, WHO, 2019. All rights reserved
Data source: IVB Database

Disclaimer:

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Based on data received 2019-05 and covering the period between 2018-04 and 2019-03 - Incidence: Number of cases / population * 100,000 - * World population prospects, 2017 revision - ** Countries with the highest number of cases for the period - *** Countries with the highest incidence rates (excluding those already listed in the table above)

Importation and Vaccination Status of Measles Cases – U.S., 2001–2019*

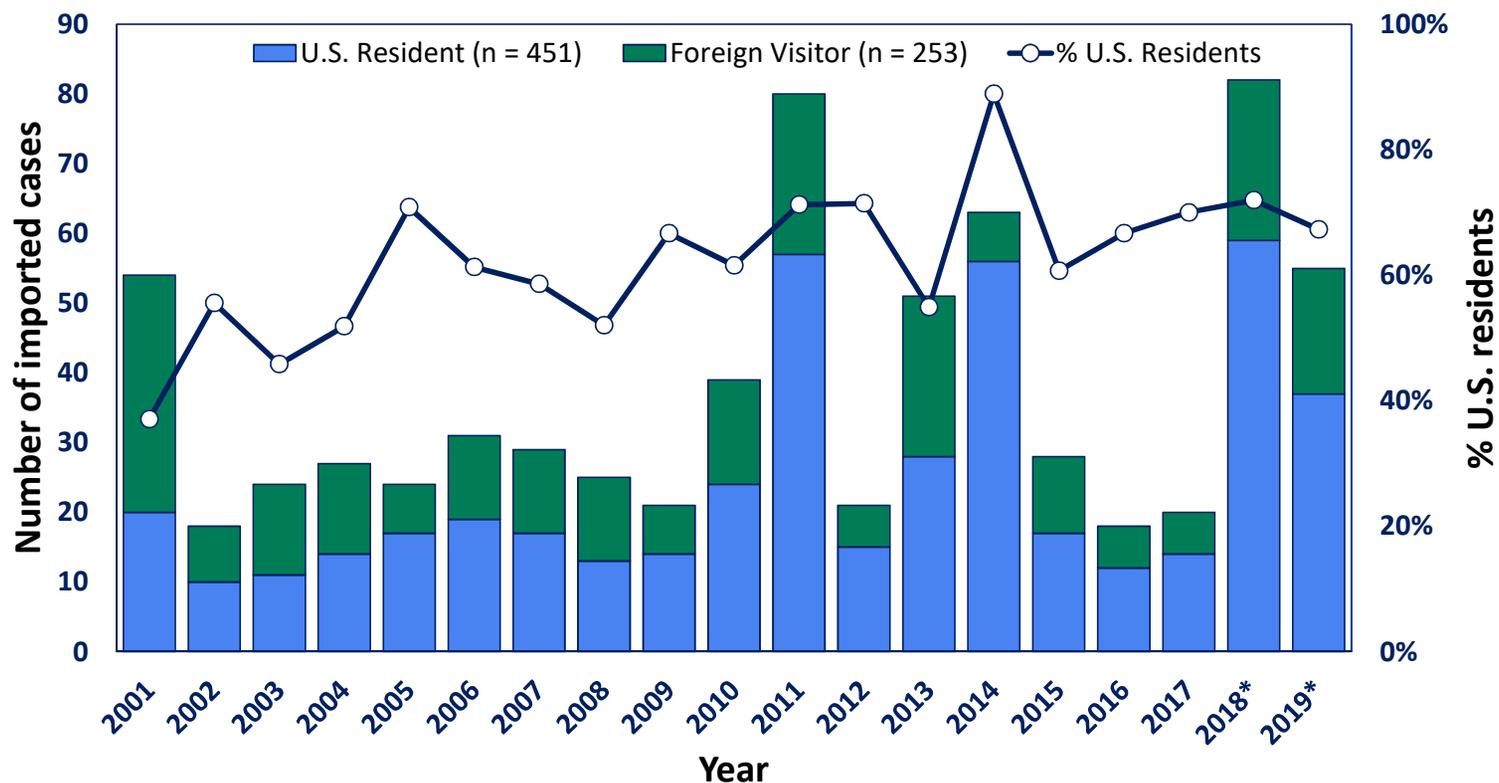
- **3,470 measles cases reported to CDC during 2001–2019**
 - 710 (20%) international importations
 - 2,760 (80%) US-acquired
- **Vaccination status**
 - Unvaccinated: 2402 (69%)
 - Unknown: 655 (19%)
 - Vaccinated (≥ 1 dose MMR): 413 (12%)

*2018 and 2019 data are preliminary as of May 17, 2019



Who is bringing measles into the United States?

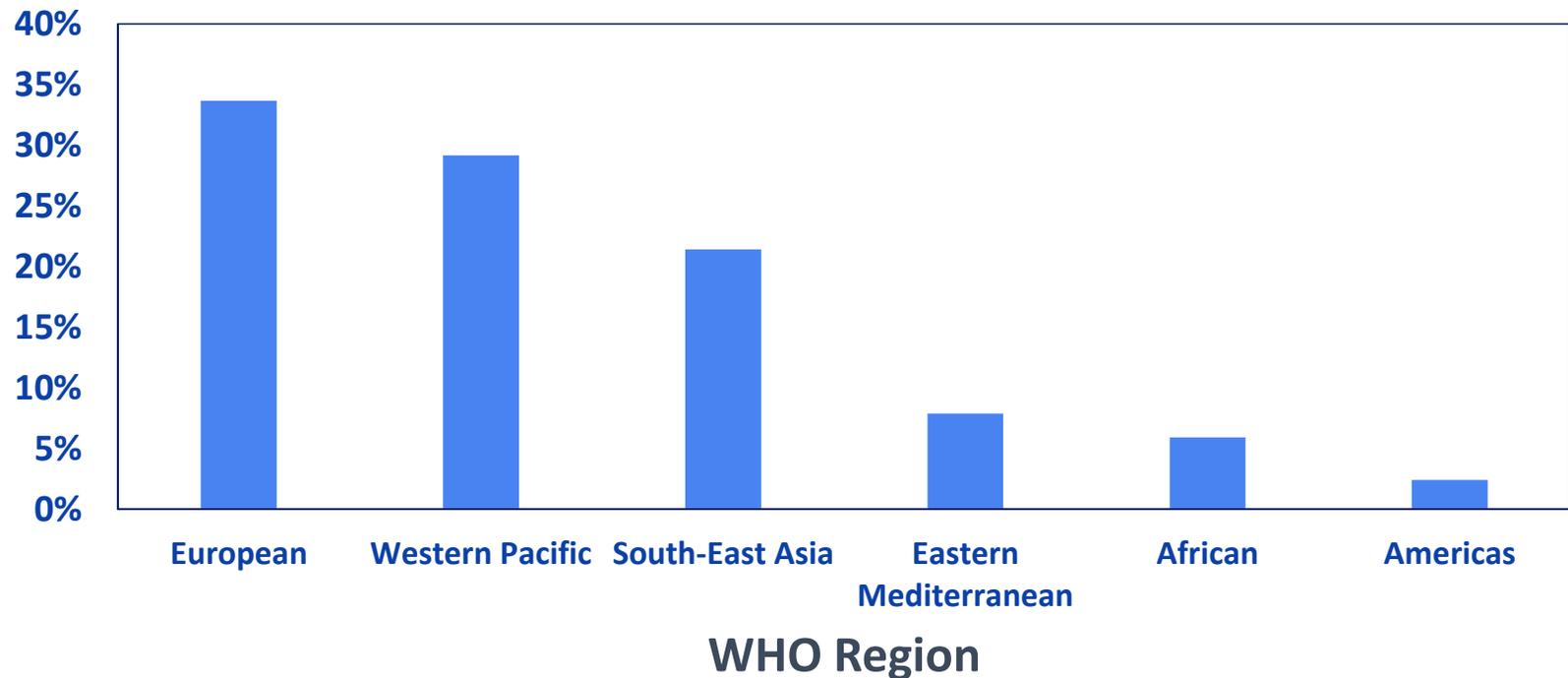
- U.S. residents traveling abroad are responsible for 64% of direct importations



*2018 and 2019 data are preliminary as of May 17, 2019

Measles Importations by WHO Region — U.S., 2001–2019*

- Imported case-patients reported travel to 77 different countries during their exposure periods



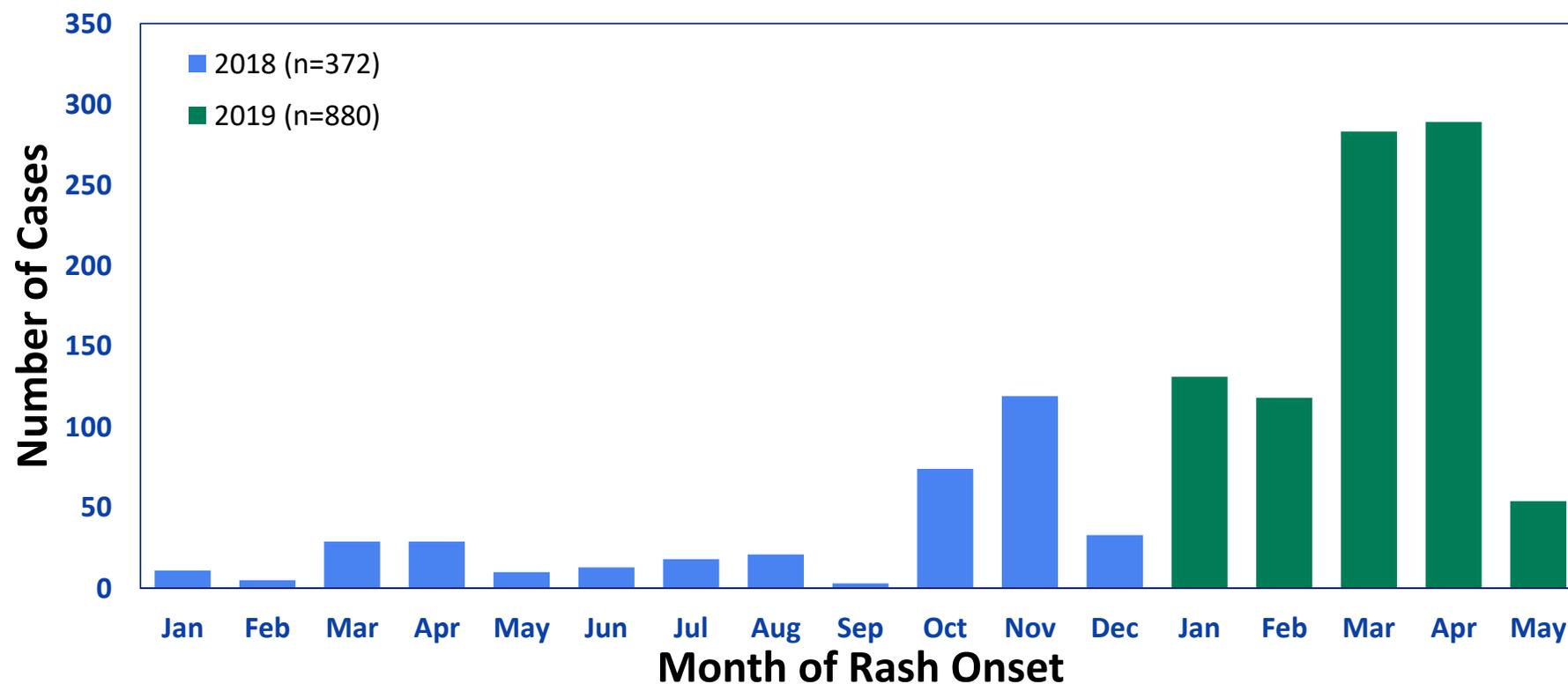
*2018 and 2019 data are preliminary as of May 17, 2019

Measles Importations by State— U.S., 2001–2019*



*2018 and 2019 data are preliminary as of May 17, 2019

Number of Reported Measles Cases by Month – U.S., 2018–2019* (N=1252)



*Source: National Notifiable Diseases Surveillance System (passive surveillance); 2018 and 2019 data as of May 17, 2019

Measles National Summary – January 1 – May 17, 2019

- 880 cases (24 states) from January 1 – May 17, 2019
 - 55 (6%) were internationally imported
 - Top three source countries are the Philippines (15 imports), Ukraine (9 imports), and Israel (9 imports)
 - 825 (94%) were U.S.-acquired
- Median age 6 years (Interquartile range: 1.5 to 20 years)
- 90% of all reported cases were unvaccinated or had an unknown vaccination status
- 94% of all reported cases are outbreak-related
 - 75% are related to outbreaks in NYC or NYS
- 9% Hospitalized
- Genotypes identified: D8 and B3

Number and Vaccination Status of Measles Cases, by Age-Group – U.S., January–May 2019*

Age-Group	No. of cases	IR per million population	Vaccination Status of Cases		
			Unvaccinated	Vaccinated	Unknown
0-5 months	30	15.23	30 (100)	0 (0)	0 (0)
6-11 months	81	41.12	76 (94)	5 (6)	0 (0)
12-15 months	86	65.56	79 (92)	7 (8)	0 (0)
16 months-4 years	193	13.14	168 (87)	23 (12)	2 (1)
5-17 years	241	4.49	218 (90)	14 (6)	9 (4)
18-29 years	82	1.52	26 (32)	27 (33)	29 (35)
30-49 years	100	1.19	12 (12)	11 (11)	77 (77)
≥50 years	39	0.34	3 (8)	2 (5)	34 (87)
Overall	852	2.62	612 (72)	89 (10)	151 (18)

*US residents only; 2019 data as of May 17, 2019

Summary

- The United States remains in elimination, although ongoing outbreaks in close-knit communities and increased global measles activity puts the U.S. at risk for losing status
- Of the >3400 cases reported from 2001 to May 2019, one-third of cases have occurred in the past 18 months
- U.S. residents traveling abroad account for two-thirds of measles cases directly imported into the U.S.
- Almost 90% of cases reported since 2001 were either unvaccinated or had an unknown vaccination status
 - Unvaccinated infants remain the highest risk group

Healthcare infection prevention and control for measles

Ryan Fagan, MD - Consultation and Training Team Lead, Division of Healthcare Quality Promotion, CDC



Introduction: Measles and Healthcare Settings

- During 2001-2014, 6% (78/1,318) of non-imported U.S. measles cases were transmitted in healthcare settings
 - Though it is a rare occurrence, 66% (19/29) of healthcare personnel (HCP) infected at work had adequate evidence of immunity
 - *Clin Infect Dis. 2015 Aug 15;61(4)
 - Take steps to avoid delayed recognition + implementation of appropriate precautions for measles
 - Persons at high risk for severe illness and complications include **infants/children aged <5 years, adults aged >20 years, pregnant women, and immunocompromised persons**
- 

Challenges

- Lack of data to clearly define exposure
 - Airborne survivability of measles virus up to 2 hours
<https://www.cdc.gov/measles/about/transmission.html>
 - One of the most contagious of all infectious diseases
 - Sometimes difficult to determine shared air space
- Most healthcare settings and areas within facilities are not engineered to handle highly contagious airborne agents

Core Measles Prevention Strategies for Healthcare Settings

- **Community vaccination is the main prevention strategy for ALL settings**
 - Proactively ensure that HCP have presumptive evidence of immunity
 - Rapidly identify and isolate measles patients (known or suspected)
 - Effectiveness of source control has not been formally studied for measles, however
 - The evidence base is strong that facemasks help contain respiratory secretions in patients with respiratory viruses
 - Adhere to Standard and Airborne precautions
 - Appropriately manage exposed and ill HCP
- 

Minimize Potential Exposures Before Arrival

- By phone
 - Ask about symptoms of measles
 - Provide patient instructions for arrival
 - Which entrance
 - Which precautions (e.g., notify staff, provide facemask, follow triage procedures)
- By medical transport
 - Instruct Emergency Medical Services staff to notify receiving facilities in advance when transporting a patient with known or suspected measles

Minimize Potential Exposures upon Arrival

- Post visual alerts and instructions at entry points
- Prepare triage stations to rapidly identify patients with measles
 - Provide facemask to patient
 - Preferably, separate from other patients prior to entry to facility
- Isolate and adhere to Standard and Airborne Precautions (<https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf>)

Patient Placement

- Immediately place the masked patient in an airborne infection isolation room (AIIR)
 - For additional definitions and considerations see:
<https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf>
- If AIIR not available
 - Place the masked patient in a private room with the door closed
 - Transfer as soon as possible to a facility with an AIIR
 - Preferably, avoid placement where room exhaust is recirculated without high-efficiency particulate air (HEPA) filtration

Transporting Measles Patients Within and Between Facilities

- Limit transport to essential purposes (e.g., cannot be provided in patient's room / facility)
 - Patient should wear a facemask
 - Notify HCP in advance:
 - Receiving area within the facility
 - Transport vehicle
 - Receiving facility
- 

Airborne Precautions

- AllIR should meet current standards with daily monitoring of pressure*
- All HCP entering the AllIR (**regardless of presumptive evidence of immunity**) should use respiratory protection at least as protective as a fit-tested, NIOSH-certified disposable N95 filtering facepiece respirator
- Continue for patients for 4 days after the onset of rash
 - Or duration of illness for immunocompromised patients
- Limit visitors to those necessary for well-being and care
 - Visitors without evidence of immunity **should not enter the room**

*<https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf>

Airborne Infection Isolation Room (AIIR) Standards

- Provide at least 6 (existing facility) or 12 (new construction/renovation) air changes per hour
 - Direct exhaust of air to the outside *or* direct through high efficiency particulate air (HEPA) filtration before returning to air handling system
 - Monitor pressure daily with visual indicators (e.g., smoke tubes, flutter strips) regardless of presence of differential pressure sensing devices
- 

Standard Precautions and Regulated Medical Waste for Measles Patients

- Standard cleaning and disinfection procedures
- EPA-registered disinfectants per manufacturer's instructions
- No special management of waste is required
 - Follow federal and local regulations for management of regulated medical waste

Assessment and Management of Exposures

- No established definition
- At the time as and up to 2 hours in a shared air space after a measles patient was present
 - If known for a given air space (e.g., AIR, most ambulances), the rate of air changes per hour (ACH) can be used to estimate the time for 99.9% removal efficiency for airborne contaminants
 - Determination of shared air space beyond a single room/area depends on knowledge of specific air handling system
- Focus on reducing risk with core prevention strategies

Air Changes per Hour (ACH) and Time for Airborne Contaminant Removal

ACH	Time (mins.) required for removal 99% efficiency	Time (mins.) required for removal 99.9% efficiency
2	138	207
4	69	104
6	46	69
8	35	52
10	28	41
12	23	35
15	18	28
20	14	21
50	6	8

<https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#tableb1>

Outbreak Considerations Involving Large Number of Patients

- Consult infection control professionals before patient placement to determine the safety of alternative rooms that do not meet AIIR requirements
- Place together (cohort) patients with measles in areas of the facility that are separated from the rest of the patient population, especially those at increased risk for infection
- Use temporary portable solutions (e.g., exhaust fans) to create negative pressure environment in the converted area of the facility
 - Discharge air directly outside away from people and air intakes, or
 - Direct all air through HEPA filters before introduced to other air spaces

Management of Exposures

- CDC recommendations have not changed:
<https://www.cdc.gov/measles/hcp/index.html#prophylaxis>
- Post-exposure prophylaxis
 - Offer to people who cannot readily show that they have evidence of immunity against measles; note specific recs for infants, pregnant women, and severely immunocompromised patients
 - For HCP without evidence of immunity, MMR within 72 hrs or IG within 6 days, and **exclude from duty from day 5 after first exposure to day 21 after last exposure regardless of post-exposure vaccine**
- *Do not administer MMR + IG simultaneously; invalidates vaccine*

Measles Reporting within Facilities and to Public Health Authorities

- Promptly communicate with key facility staff, including leadership, infection control, hospital epidemiology, occupational health
- Immediately notify public health authorities about new cases, including suspected healthcare-associated transmission



Thank you

For more information, contact CDC
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- Submit your question.
- CDC Media: media@cdc.gov or 404-639-3286.
- Patients, please refer your questions to your healthcare provider.

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What: Video with closed captioning

Where: On the COCA Call webpage

https://emergency.cdc.gov/coca/calls/2019/callinfo_052119.asp

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Upcoming COCA Call

Topic: Update on *Candida Auris*

Date: Thursday, June 20, 2019

Time: 2:00-3:00 p.m. ET

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		CDC Clinician Outreach and Communication Activity

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		COCA Learn
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		CDC Clinician Outreach and Communication Activity

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		COCA Now
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Informs clinicians of new CDC resources and guidance related to emergency preparedness and response. This email is sent as soon as possible after CDC publishes new content.

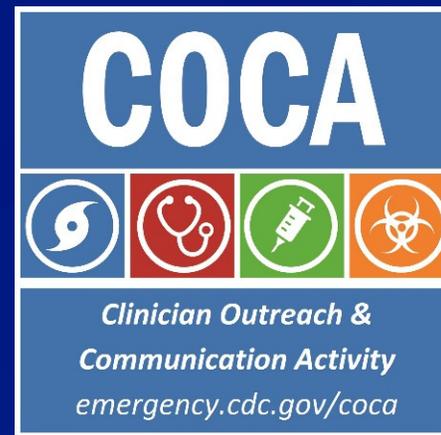


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